Fog and Rain in the Amazon

Research Highlight

The diurnal and seasonal water cycles in the Amazon remain poorly simulated in general circulation models. Simulations using existing models exhibit peak evapotranspiration during the wrong season and rain occurring too early in the day. We show that those biases are not present in cloud-resolving simulations with parameterized large-scale circulation. The difference is attributed to 1) the representation of the morning fog layer and 2) more accurate characterization of convection and its coupling with large-scale circulation. The morning fog layer, present during the wet season, but absent in the dry season, dramatically increases cloud albedo, which reduces evapotranspiration through its modulation of the surface energy budget. These results highlight the importance of the coupling between the energy and hydrological cycles and the key role of cloud albedo feedback for climates over tropical continents.

We demonstrate that we can resolve the seasonality of the hydrologic cycle in the Amazon using an approach, opposite to general circulation models, in which we resolve convection and parameterize large-scale circulation as a function of the resolved convection.

The results emphasize the key role of cloud albedo feedback and, in particular, of the morning fog layer in determining the diurnal course of surface heat fluxes and seasonality of the surface and atmospheric heat and water cycles. These results indicate that our understanding of tropical climates over land can be considerably advanced by using coupled land#atmosphere models with explicit convection and parameterized large-scale dynamics.

Fog is seen here at eddy covariance tower K87. Image courtesy of Joe Berry, Carnegie Institution for Science.

A second instance of fog is seen here at eddy covariance tower K87. Image courtesy of Joe Berry, Carnegie Institution for Science.

Reference(s)

Anber U, P Gentine, S Wang, and A Sobel. 2015. "Fog and Rain in the Amazon." Proceeding of the National Academy of Sciences, 112(37), doi:10.1073/pnas.1505077112. ONLINE.

Contributors

Pierre Gentine, *Columbia University*; Adam Sobel, *Columbia University*

Working Group(s)

Cloud-Aerosol-Precipitation Interactions